

abundant on these hills. This plant strikes the key-note of the flora of the district, which is essentially northern and alpine in its characters. Adjoining on the south, in Mayo, the Lusitanian heaths, *Erica mediterranea* and *Daboecia polifolia*, and other plants fully represent the remarkable southern flora which characterises the western sea-board of Ireland, and a few miles on the northern side the same features are repeated in Donegal in the occurrence of *Saxifraga umbrosa*, *Euphorbia hiberna*, and *Trichomanes radicans*. But in the Sligo flora the southern element is absent, saving the occurrence of *Adiantum Capillus-Veneris*, which may be found growing at sea-level in company with *Draba incana* and *Saxifraga aizoides*.

As it is with the plants, so with the animals. The characteristic southern forms of western Ireland are scarcely represented, while northern animals are conspicuous. The Field Club entomologists found *Pelophila borealis* literally to swarm on the shores of Lough Gill, which is only a few feet above sea-level; *Xenylla brevicauda*, an Apteron new

finned to the erosion taking place on the Yorkshire coast between Bridlington and Spurn, and the works that have been carried out in constructing promenades, sea walls, and groynes at Bridlington.

There is no novelty in the descriptive parts of these papers. It is a well known and recognised fact that on certain parts of the coast of this country considerable loss of land is taking place by the erosion of the sea. The subject occupied the attention of the geological section of the British Association in 1885, when a committee was appointed to investigate the subject of coast erosion, and reports of experts having local knowledge were obtained from all parts of the coast and printed in the reports issued from time to time, the last, which was confined to recent evidence obtained from the coast guards, being published in the report of the meeting held at Southport in 1903. We have ourselves dealt with the subject in articles in NATURE in our number for June, 1899, and on sea coast and destruction in August 23, 1900. The destruction of the Holderness

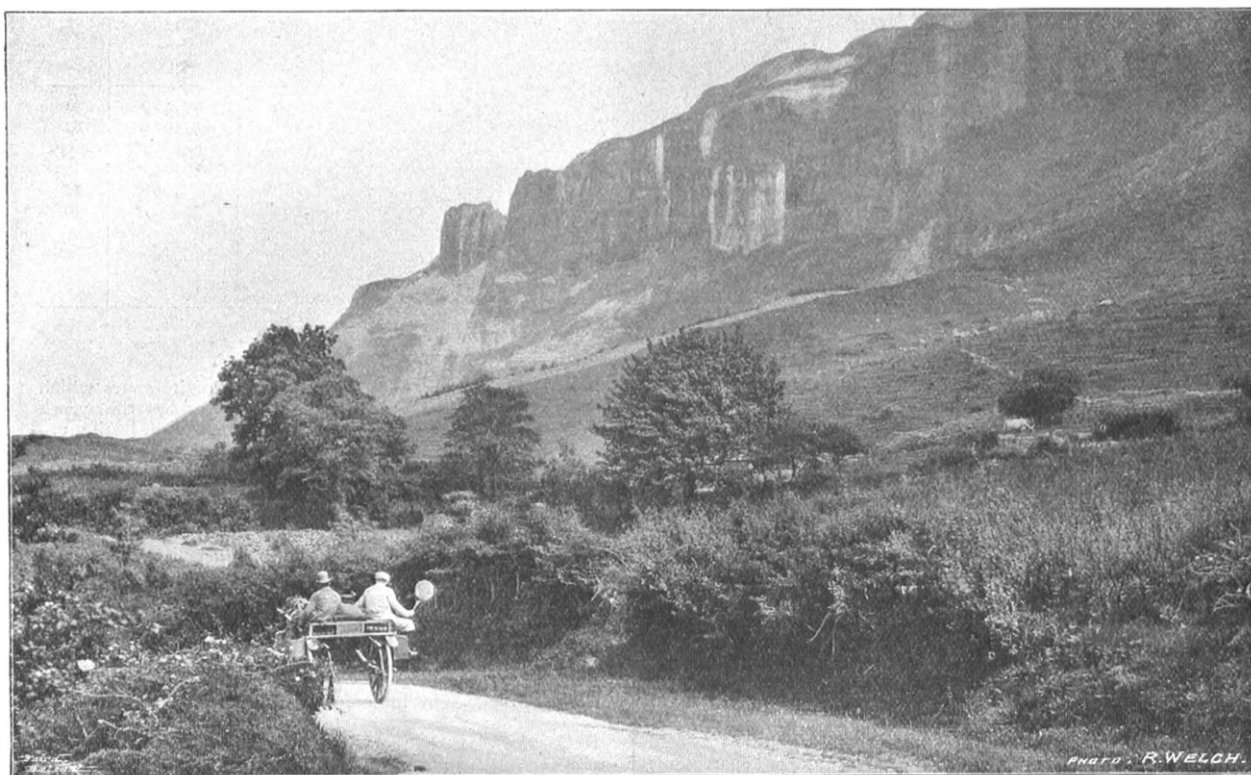


FIG. 1.—Entrance of Glencar. Showing the southern cliff-wall of Carboniferous Limestone, which rises a thousand feet above the valley.

to the British Isles, which accompanied it here, is likewise northern; and other instances might be quoted. Among other results of the Field Club visit (which are fully described in the September number of the *Irish Naturalist*) may be mentioned the discovery of three water-mites, one of which, *Eylais bicornuta*, is new to science, and the two others new to Britain.

COAST EROSION AND PROTECTION.

TWO papers on this subject were recently read at the Institution of Civil Engineers, one by Mr. A. E. Carey on coast erosion, and the other by Mr. E. R. Matthews, the borough engineer of Bridlington, on the erosion of the Holderness coast of Yorkshire.

The first paper deals generally with the whole coast of England, and briefly enumerates the salient geological features of the coast line and points out their connection with the relative rates of erosion. The second paper is con-

coast and the protective works put up to stop the erosion at Hornsea, Withernsea, and Spurn were dealt with in a paper by Mr. Pickwell on the encroachments of the sea from Spurn Point to Flamborough Head printed in the *Minutes of Proceedings* of the Institution of Civil Engineers, vol. li., 1878.

The whole subject, both as descriptive of the coast of England, the losses that have taken place, and the works that have been carried out to prevent erosion, is also very fully dealt with in the work on "The Sea Coast" published by Messrs. Longmans in 1902.

Mr. Matthews in his paper makes a statement that has frequently been made before, but for which there does not appear to be any warrant, to the effect that the material eroded from the Holderness coast is carried into the estuary of the Humber. This subject was very fully dealt with in a paper read at the British Association at Glasgow in 1901 on the source of warp in the Humber, in which it was conclusively shown that it is physically impossible for this material to be carried into the Humber, and that, as a

matter of fact, no warp is carried into the river from the sea, but that the warp in suspension is derived entirely from the solid matter brought down by the various tributaries of the river. The paper describes this matter as oscillating backwards and forwards with the tides in a zone confined to the lower reaches of the Ouse and the Trent, except that when heavy freshets are running it extends into the Humber and is then partly carried out to sea. This peculiar action is made use of to improve the value of the land adjacent to the rivers by the process of "warping." Any solid matter brought into the Humber on the flood tide consists entirely of clean sand, and has no relation to the waste of the Holderness coast.

The only novel features, therefore, in these papers is the suggestion of Mr. Carey that the matter should be taken up by Parliament, and that a body of commissioners should be created with the special function of dealing with the foreshores of England and Wales. He proposes that the coast should be divided into districts placed under commissioners, each having an engineer to act as coast warden, with power to deal with the material on the beach, and the general control and management of all foreshore lands, the costs incurred by this commission to be divided between the Treasury, the local authorities, and the landowners.

Mr. Matthews confines his ideas of Government interference to the coast of Yorkshire, and suggests that this ought to be protected against the inroads of the sea by the Government, quoting as a precedent for this that the Board of Trade protects the Spurn Peninsula. He loses sight, however, of the fact that this is done for the protection of the lighthouses which stand on the peninsula, and for the preservation of the entrance to the Humber. Mr. Matthews gives an estimate for protecting this reach of coast by sea walls and groynes, and shows, as has been done by others on previous occasions, that the value of the land swallowed up by the sea within a reasonable period would not amount to one-third of the first cost of the protective works, apart from their maintenance.

It will be remembered that recently, owing to the great destruction of sea protective works that occurred at Lowestoft and Southwold, the representatives of the sea coast towns on the east of England held a conference at Norwich and appointed delegates to interview the Prime Minister and the officials of the Government departments more particularly concerned in this matter, urging that the preservation of the coast and the sea defence works ought to be a national charge. So far, however, they do not appear to have justified their claims for such aid. It has been pointed out that most of these towns have gradually emerged from mere fishing villages into sea-side resorts, and have erected promenades and other similar works for the purpose of making their places popular, and have by this means increased the value of the land in the neighbourhood from a mere agricultural price to that of building land, very greatly to the profit of the owners of such land. It appears therefore manifestly unfair to ask the owners of the agricultural land at the back, whose rents have already been greatly depleted by the fall in value of agricultural produce during the last few years, to contribute towards works for the improvement of their neighbours' land on the coast, which they would have to do if these works were made a charge on the national revenue, and it would be equally unjust to levy contributions on inland towns which have borne the costs of large improvements for sanitary and health purposes out of their own rates.

Mr. Carey describes in his paper the evolution of a sea-side village, subject to intermittent inundation, into a watering place, in front of which the local authority charged with the works not only encloses within the sea wall nearly the whole of the shingle beach which afforded a natural protection to the shore, but also by groynes traps the whole of the travelling shingle, with disastrous results to the owner of the land to leeward. It may also be pointed out, as stated in the British Association report for 1895, that many of the disasters that occur to the sea walls and promenades of these sea-side towns are due to defective engineering and a complete disregard of the laws of nature.

It is obvious that it would be very desirable to set up some better control over the works now carried on along

the sea shore either by increasing the powers of the Board of Trade or by the appointment of a special commission, as suggested by the author of the paper. The great difficulty will be in dealing with the rights of the persons claiming the ownership of the beach material, which in many cases is sold and removed in very large quantities for concrete making, road repairs, or other purposes. The Board of Trade occasionally, on being applied to, intervenes and issues notices prohibiting the removal of sand and shingle, but its power to do so is not so well defined as it ought to be, and the whole subject requires investigation, and legislative action for regulating and controlling works carried out on the sea shore and the removal of beach material; but the preservation of the property of landowners and urban authorities out of funds provided from the national exchequer would be entirely contrary to the methods of administration hitherto pursued in this country.

THE NOVEMBER METEORS OF 1904.

THOUGH there was no prospect of a brilliant display this year, there seemed the probability of a pretty conspicuous shower. In 1838—five years after the great meteor-storm of 1833—Mr. Woods, of London, reported in the *Times* that on the night of November 12, between 15h. 25m. and 15h. 55m., "nothing could exceed the grandeur of the heavens. Meteors fell like a shower of bombshells in a bombardment and in such rapid succession as to defy every attempt to watch their particular directions or to ascertain their numbers." Mr. Woods estimated that he saw 400 or 500 meteors during the half-hour mentioned.

In 1872 also, about five years after the brilliant displays in 1866, 1867, and 1868, the Leonids returned pretty abundantly, for on November 13, 12h. to 18h., several observers at Matera, Italy, counted 638 meteors, and the display was regarded as having been much brighter than usual.

In these circumstances it was expected that the return of 1904 would be deserving of careful observation, and so it has proved, though the shower was perhaps not quite so rich as expected. The earth, however, probably passed through the denser part of the stream at about Greenwich noon on November 15, and thus it must have escaped observation in England. Reports from American stations are awaited with interest. In this country fogs were very prevalent at the important time, and at some places appear to have obliterated the phenomenon.

At Bristol during the night of November 13 there were very few meteors visible, with only occasional Leonids, but the stars were dim in the fog.

On November 14 the conditions were more favourable. Between 13h. 30m. and 15h. 45m. about 55 meteors were seen (including 33 Leonids) by the writer during a watch extending over 1½h. of the period named. It was considered that Leonids were appearing at the hourly rate of 25 for one observer. After 16h. increasing fog interfered with observation. The Rev. S. J. Johnson at Bridport had, however, a very clear sky after 16h., and noted a fairly numerous display of Leonids, including one as brilliant as Venus and several equal to Jupiter. He does not mention the exact number seen.

Mr. C. L. Brook at Meltham, near Huddersfield, watched on November 14 between 16h. and 18h., and counted 69 Leonids, of which number 17 were observed in the first quarter of an hour. Other results have come to hand which corroborate Mr. Brook's figures, and show that the maximum was attained between 15h. 50m. and 16h. 20m., when the rate of apparition was 1 Leonid per minute in the sphere of vision commanded by one observer.

There appear to have been very few Leonids seen either on the nights of November 13 or 15.

As observed at Bristol, the radiant seemed to be an area 4 or 5 degrees in diameter, with its centre slightly west of γ and ζ Leonis, or at $151^{\circ}+23^{\circ}$. There were several minor showers visible, and two of these were well pronounced at $43^{\circ}+21^{\circ}$ and $144^{\circ}+37^{\circ}$.

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